Troll DW

Canopy User Manual

Version 1.0 – May 2005

Disclaimer:

The following information must be read and understood before any use of this equipment.

The user knows the risks of skydiving and BASE jumping and accepts that:

Skydiving and BASE jumping cause deaths and serious injuries. Many of these deaths and injuries can be attributed to equipment malfunctions. Skydiving and BASE jumping equipment can fail, even if the user takes all possible precautions.

Failure to open the main or reserve parachute (or to follow emergency procedures) at a safe altitude, and/or equipment failures can result in severe injury or death.

It is the user's responsibility to:

- Receive proper training before any use of all skydiving and BASE equipment.
- Be extremely careful and cautious.
- Read and understand all owner's and operations manuals for all skydiving and BASE equipment.
- Check all skydiving and BASE equipment and replace any defective or worn component prior to use.
- Review emergency procedures before each use of this and all skydiving and BASE equipment.
- Check equipment warnings - do not exceed equipment limitations.
- Never violate the training and experience requirements for the specific equipment in use.

Because of the unavoidable dangers involved in the use of this and all parachute equipment, Atair (including, but not limited to, all owners, officers, staff and employees) makes no warranties of any kind, expressed or implied. It is sold with all faults and without any warranty of fitness for any purpose. By using this equipment or allowing it to be used by others, owner/buyer waives any liability of Atair for personal injuries, death or damages from such use. Any promises or representations inconsistent with, or in addition to this statement of warranty are not authorized by Atair and shall be not binding.

Skydiving and BASE jumping are high-risk activities which may cause or result in serious injury or death.

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Appendix A: Contact Info

Dear Valued Customer,

We'd like to thank you for purchasing a new Atair Canopy. We're confident you'll be pleased with it in every way and that you'll enjoy how it opens, flies and lands.

We ask you and your rigger to carefully inspect your new canopy to completely familiarise yourself with its features and the quality workmanship. Should you find anything that does not seem right or if you have any questions please don't hesitate to contact us: stane@basetroll.com

Thank you again for selecting an Atair canopy. With proper care it should last many years and hundreds of jumps.

Blue Skies!

Stane Krajnc
The Atair Canopies Team

Troll DW

In memory of **D**wain **W**eston. Jan 31st 1973 - October 5th 2003

Dwain Weston, changed the face of modern BASE jumping. He took the sport to a new level, leaving it much richer than when he found it. Dwain is remembered for his incredible aerial skills but his contribution, achievements and passion for BASE jumping will live on in all of us.

Photo by: Yuri

Dwain was the first to spot the potential of the original prototype Troll canopy during the Petronas tower event in Malaysia, he approached Atair and asked to try the canopy. Dwain performed many jumps with the canopy from various objects and provided Atair with invaluable input on how to improve the canopy.

Dwain spent much time with Stane, the owner of Atair, discussing the optimum characteristics of BASE canopies and the desired features he would like to see in future canopies. These discussions were instrumental in the design of the Troll DW canopy.

Section 1: How to use this manual

We know you are excited to receive your new canopy and will most likely be packing it now as you read this manual.

But please take time to read this manual completely, regardless of your experience level!

You will learn about:

How to assemble, pack and safely use your : Troll DW
The great new features of your :
How to get the most out of your :
How to take care of your :

WARNING

ATAIR TROLL DW CANOPY - USER MANUAL

This manual is **not** a course of instruction on how to make a parachute jump, nor does it contain regulations that govern sport parachuting and related activities.

Section 2: Introducing Atair

www.AtairCanopies.com or www.BaseTroll.com

Atair was founded in 1992 by Stane Krajnc and his wife Magdalena in Slovenia. With a strong background in paragliding design, Atair was formed to supply the paragliding industry with reserve canopies. With a strong passion for both paragliding and skydiving, Atair naturally dedicated their resources to developing new technological advances in Skydiving and BASE canopies. To date Atair has manufactured over 12,000 rounds and several thousand skydiving and BASE canopies.

In the past, Atair canopies have been sold through private labelling (Alpha, Ace, Viper, Impulse, Space, etc.). Now all of the Atair products are available directly from Atair.

Stane Krajnc, the owner of Atair, has been involved in air sports for the past 30 years. In 1973 Stane designed, constructed and flew his own hang glider. He has now accumulated over thousands of hours on hang gliders & paragliders, 700 skydives and over 300 BASE jumps.

Atair does not only make canopies for skydiving and BASE jumping, recent special projects have included:

- Specialised large canopies for cargo applications,
- Drag chute for speed ski world record,
- Special low glide ratio canopy for a cave BASE jump.

Section 3: Features of your Troll DW Canopy

Atair is proud to introduce the Troll DW canopy.

The Troll DW is a low aspect ratio 7-cell canopy that is constructed of the highest quality materials and is heavily reinforced in crucial high load areas such as bridle and line attachment points. This enables it to withstand the heavy demands of BASE-jumping. The Troll's unique aerofoil has a specially shaped upper surface that creates uniform skin tension and prevents deformation. This makes for a more efficient wing with less drag.

Mission of the Troll DW Canopy

A Canopy that has:

- Good on-heading performance
- Consistent deployment altitude and inflation time
- Excellent openings (slider up and down)
- An excellent speed range, superior glide in full flight whilst stable and controllable in steep deep brake flight
- Good flare power from full flight and also from deep brakes
- Performs flat turns efficiently without diving.

Features of Troll DW

- New wing design with thicker airfoil section with improved performance at low air speed. The airfoil provides more lift at low air speed giving better performance when conducting deep brake approaches.

- Increased material tension on the leading edge, thanks to specially shaped top skin, further reducing drag and improving performance.

- Triple cross-porting allows excellent pressurization in both slider-up and slider-down configurations.

- Load-bearing seams have chord-wise reinforcing at the line attachment points and the lower surface has span–wise reinforcement in all high stress areas.

- The Mono Directional Valve technology (or MDV) system has been redesigned, incorporating a fifth air in-take in the center, the surface area of the vents is the same with each vent made smaller. This redesigned version of the MDV has even better inflation characteristics in terms of symmetrical inflation and inflation times.

MDV Technology

The MDV from Atair is unique in that it is a zero-p tubular shaped funnel that is about 6" long. They are attached to mesh inlets on ribs 2, 3, 4, 5 & 6.

This design allows the air to flow in during pressurization and also during deep brake decent, but the valve closes when air is rushing in from the nose or when you have back pressure coming from the tail. The Troll in its standard form is already a very stable canopy. The MDV Troll offers more stability by increasing the range in which you can fly in deep brakes before you actually reach the stall point. The canopy has a great flare in both its standard form and with the MDV technology.

The MDV inlets have increased the speed in which the canopy pressurizes slider up as well as slider down. Obviously, the true benefits to having inlets are for slider down jumps. When the canopy is jumped in the slider down configuration it offers single stage pressurization and slider up it opens a little faster than the standard Troll. If you are going to do many terminal jumps at a given time, it is advisable to switch sliders to a marquisette mesh (small hole mesh slider). This helps take the edge off of the opening without compromising consistency. Sail sliders have been known to cause opening/heading inconsistencies on BASE jumps and we don't advise their usage. MDV technology offers superior pressurization, giving the jumper control over the canopy immediately. Control = Confidence!

Standard with each Troll:

* Integrated Primary-Stow tail pocket for safer low-speed deployments
* Standard and custom deep brake settings
* High visibility "contrasting" steering lines
* Mesh Slider choice of large hole mesh / small hole mesh (Sail Slider available upon request. Advised for skydiving only)
* Tail Gate Reefing Device (BR)
* Optional black lines available.

Section 4: Recommended Sizing & Wing loading

The Troll DW is available in five precisely scaled sizes: (Note – Atair measures surface area by measuring the span x chord of the bottom skin. Stane Krajnc, the designer of the Troll, feels that this measurement best represents a flying canopy).

* 205 ft.2 = PIA spec 219
* 225 ft.2 = PIA spec 240
* 245 ft.2 = PIA spec 260
* 265 ft.2 = PIA spec 282
* 285 ft.2 = PIA spec 301
* 305 ft.2 = PIA spec 322

Model	Troll 205	Troll 225	Troll 245	Troll 265	Troll 285	Troll 305
Number of Cells	7	7	7	7	7	7
Surface area ft²	205	225	245	265	285	305
Span ft.	21.5	22.5	23.5	24.6	25.6	26.2
Chord ft.	10.2	10.7	11.2	11.7	12.1	12.5
Aspect Ratio	2.1	2.1	2.1	2.1	2.1	2.1
Pack Volume in³	465	492	534	580	638	698
Canopy Weight (lbs.)	7.1	8.4	9	9.6	10.2	11.2
Average Body Weight lbs	114	135	157	180	202	225
Average Body Weight kg	51	61	71	82	92	102

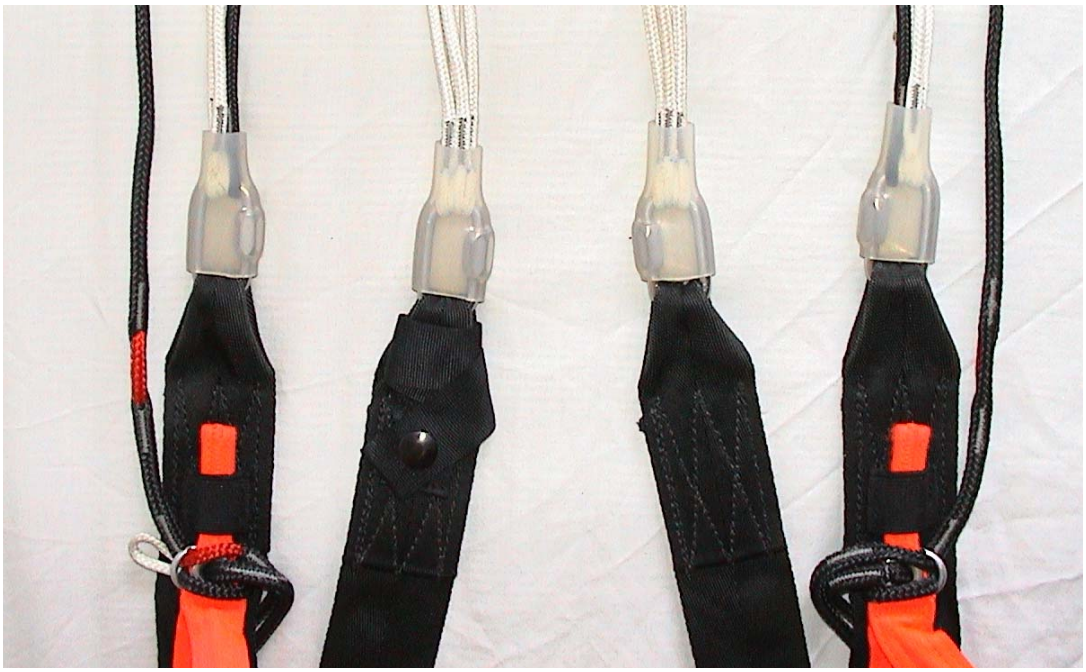
Section 5: Setting Up Your Troll DW Canopy

List of Components

- Canopy and lines
- Tail Gate (BR) and rubber bands 1 1/4“ by 1 3/16“ (3.2 cm by 0.5cm)
- #5 Stainless Steel Links
- Rubber Slider Bumpers
- Slider

Attaching to risers, checking continuity

Line & Riser Continuity



Left Rear Left Front Right Front Right Rear

Remember that each connector link has to show continuity from the lines to the canopy. Check each one for proper assembly.

Each of the links will have four cascading lines. The two control lines each cascade into five.

Once you have orientated the lines properly on the #5 links, inspect them. Finger-tighten all 4 connector links. Then apply a 1/8 turn with a 9mm wrench. Do not over tighten as this can strip or crack the link and cause it to fail. Slide the slider bumpers (covers) over the links.

Section 6: Recommended Drills for first flight

Atair **strongly recommends** you perform some skydives with your new canopy before using it in the BASE environment.

To do this we recommend packing your Troll DW into a large skydiving container (as used for student skydivers).

Perform a hop 'n pop from a suitable legal altitude (with clearance from the dropzone).

During the flight, try the following drills:

- Gradual flare to locate stall point
- Full flare to simulate landing
- Full stall and recovery by slowing and equally releasing brakes
- Flare from half brakes
- Flare from deep brakes
- Full toggle turns
- Elevation turns (in braked flight release one toggle slightly to turn)
- Half brake turns
- Deep brake turns
- Rear riser turns
- Front riser turns
- Check length of brake line between cats eye and toggle, are you getting a full flare when you bring your hands to waist level?
- Sharp 180º turn using alternate rear risers (simulating 180º off heading drill)

Remember to pay attention to your altitude and position relative to the dropzone.

Atair also advises you to tune your brake settings by making subsequent skydives on the canopy.

To make adjustments to the brake settings, mark the stall point on the brake lines at the level of the guide ring using a marker pen. Consult an experienced rigger when adjusting the position of the deep brake and normal brake setting position.

If the length of brake line between the brake setting and toggle is too long take a wrap of line around your hand and estimate how much the toggle attachment point should be shortened ; again consult an experienced rigger when adjusting the position of the toggle attachment.

Section 7: Packing your Troll DW Canopy

Before you begin this section, please read the entire manual. If there is any element that you don't understand, please contact us or a qualified rigger to help you with the assembly.

Ensure that you have correctly assembled the canopy onto the risers (see section 5) and that you have proper line continuity. Be certain to secure the container so that it does not move during the packing process. Make sure that the risers are even and remain even at all times.

The first packing method to be described is without slider or slider down. Make certain that the control lines go directly from the toggle to the outside of the canopy without passing through anything. Make sure the toggles are attached to the control line correctly (see section 8).

If the container you are using does not have a slider retainer you must use a suitable material to fix the slider in place, consult your local rigger if you have any doubts. The other alternative is to completely remove the slider by releasing each connector link in turn using a spanner: this is time consuming and there is a risk of re-connecting the lines in the incorrect manner.

Figure 1a

Figure 1b

Figure1a: To start of the pack job you should perform a PRO (Proper Ram-Air Orientation) pack job. Flake the canopy in a traditional pro pack manner. Before you bring the tail around, count the three nose cells on one side and bring the tail around behind them. In other words do not cocoon the tail around the nose. Leave the nose cells exposed.

Do the same on the other side, leaving the center cell to hang down in the middle. Gently place the canopy on the ground, keeping tension on the lines. The neater you place the canopy, the easier it will be to redress it once it's on the ground. Find the three nose cells on each side and tease them out gently. They should be resting neatly on top of one another, resembling figure 1b above.

Figure 2

Figure 2: Pick a side to start redressing. From the bottom stabiliser, reach in between the A and B lines and flake all of the fabric to the outside, keeping the lines orderly in the center. From the next stabilizer, reach between the B and C lines, flaking all of the fabric to the outside, keeping the lines orderly in the center. Now reach in between the C and D lines, flaking all of the fabric to the outside, keeping the lines orderly in the center.

Be certain to maintain tension on the lines by gently pulling the appropriate fabric from the top of the canopy during this process. Next, be sure to clear the fabric between the D lines and the control lines. This is done by placing your hand between the D lines and the control lines and pulling away from the container. This will remove the slack in the fabric between these two points. Repeat all of this on the other side and redress by lifting the tail up so that the lines are exposed. From either side, you can ensure that the fabric is all pulled away from the container and that the stabilizers are clear of the lines as well. During this process, be sure to keep tension on the lines. Ensure that the pack job is symmetrical by looking at the line attachment points on each side and making certain they are even.

To flake the tail, grasp the small portion of stabilizer between the D and tail on one side and pull the fabric outward keeping the seam in the center and going straight up and down. This should place the outer upper control line to the center. Continue by stacking all of the seam to the tail in the center, pulling the fabric out and away from the center. Use the seams as a guide. These will be half-cell folds. Continue all the way across and include the center cell tail pocket. Remember, not every fold will incorporate a control line. Do this on both sides until all seams are on top of one another and in the center. Make certain that the canopy is completely symmetrical at this time.

Section 7.1: Tail Gate Installation
(for packing with a slider, see next section)

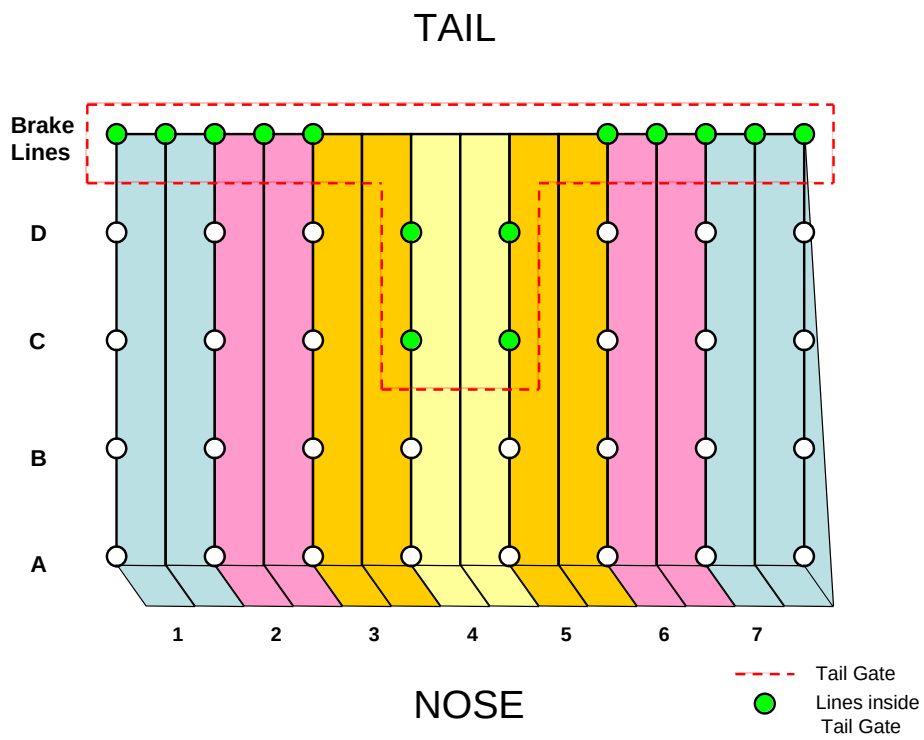


Figure 3: Diagram showing lines included in Tail Gate

The Tale Gate (BR) reefing device is used to help reduce brake line malfunctions during no slider jumps. The Tail Gate helps keep the lines in the center of the canopy; the lines included in the Tail Gate are shown in the diagram above.

Refer to figures 3a and 3b. The slot for the Tail Gate is on one of the center C lines approximately 4" down from line attachment tab. Find this slot and place the Tail Gate into it. When utilizing the Tail Gate, you should use a rubber band $^{1}/_{4}$ inches by 1 $^{3}/_{16}$ inch (3.2 cm by 0.5cm). Some people like to lark's head the rubber band to the Tail Gate. Using the lark's head is not recommended for extreme low-speed deployments as it could cause a hang up in release of the Tail Gate.

Figure 3a

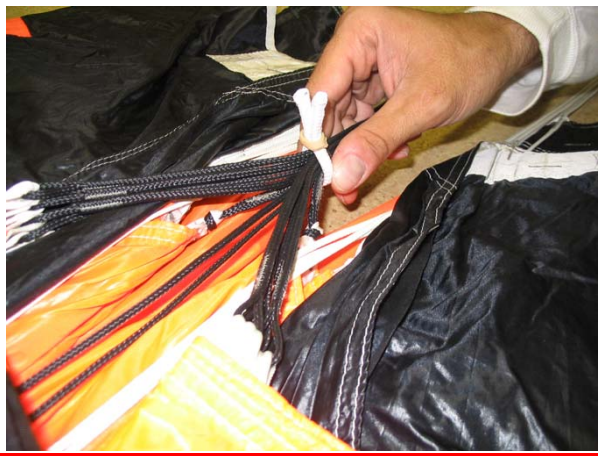


Figure 3b

Ensure that there are no twists in the risers. Grasp the inner most line on both rear riser links and then grasp the two lower control lines. Walk these four lines toward the canopy. These four lines will cascade into 12 (or 14) lines. These are the 12 (or 14) lines that will be placed into the Tail Gate. Make certain that there are no other lines caught up in these 12 (or 14) lines. The illustration represents the lines as viewed from the bottom surface of the canopy. Be certain that only the lines that are encompassed in the 'T' are inside the Tail Gate.

The C line that the Tail Gate is attached to MUST be inside the Tail Gate, so as not to load the insert piece. Place all 12 (or 14) lines into the Tail Gate. Close the Tail Gate with two to three wraps of the rubber band, as shown in figure 3a and 3b. Check to be certain that there are 12 (or 14) lines in the Tail Gate and that the Tail Gate C line is inside the Tail Gate. Go to section 7.3 to continue with the packing process.

Section 7.2: Packing with a Slider

DO NOT USE A TAIL GATE WHEN PACKING WITH A SLIDER. Ensure proper line continuity and be certain that the control lines go from the outside of the canopy through the slider grommet of the rear riser on its corresponding side. Then take the control line through the guide ring on the corresponding riser. Refer to section 8 to ensure proper control line routing and toggle assembly.

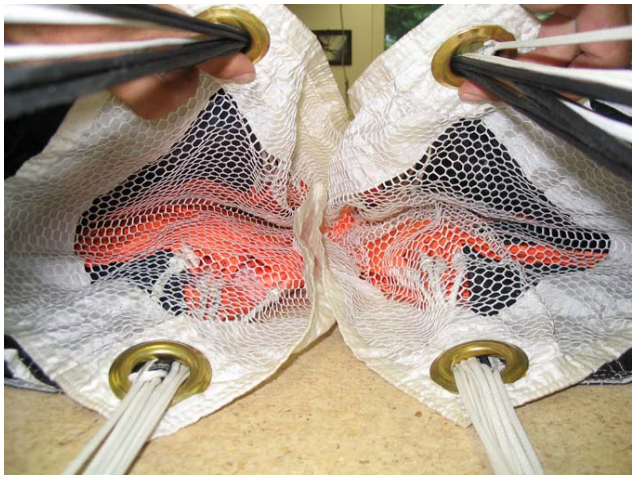


Figure 4a

Figure 4b

Follow the previous packing instructions up through figure 2. For slider placement, ensure proper line continuity, keeping the left and right separation with the front slider grommets closest to the canopy. The slider tape should be facing upward. Pull the slider so that the front grommets rest against the bottom of the stabilizers at the B line slider stops on both the left and right hand side. Gently lift the tape between the two rear grommets of the slider and pull up until the grommets are resting against the bottom of the stabilizers at the C line slider stops on both the left and right side.

The slider tape and fabric between the front and rear grommets should be placed between the B and C fold of the canopy. Be certain that this is done to the left and right side. This is basically quartering the slider. We don't stow our sliders. Go to section 7.3 to continue with your pack job.

Section 7.3: Packing Continued

Figure 5

For packing with a slider refer to section 7.2 and then return to this section.

Figure 5: Make certain that all the lines are to the center and that the canopy is symmetrical with the left side of the canopy to the left of the center and the right side of the canopy to the ride side of the center. There should be a nice channel down the center of the canopy. Locate the center cell Tail pocket and bring it down to the edge of the stabilizers. Grasp the tail fabric on each side and above it. While kneeling on the Tail Pocket, bring the bottom outer portion of one side of the tail back and expose the stacks of canopy. Fold the outside edge of the first two stacks inward towards the canopy. This should be done in one long fold. We don't utilize clamps, but if you like to use them, this is when you would want to secure this fold. Repeat this on the other side. Next, fold the outside edge of the bottom stack inward towards the canopy using the same technique as on the first two stacks. This fold should be beneath the fold of the first two stacks. Do the same on the other side.

Whilst kneeling on the canopy at the Tail Pocket, run your forearm at a 90˚ angle up the canopy from the Tail Pocket. Let your arm rest about half way up the canopy while you use the other hand to tuck small portions of the tail around the entire canopy. Having your arm across the width of the canopy helps ensure that you don't pull any lines away from the center of the canopy whilst wrapping/tucking the tail. Make the finished width of the fold even with the edges of the Tail Pocket. Do not cover the nose. Work the air out and count the nose cells on each side, making sure that you count three on the left and three on the right.

The center cell is underneath and will be accounted for when placing the canopy in the container. Lightly tuck these cells under the pack job, your canopy should now resemble Figure 5.

Figure 6a & 6b: Primary Stow

Figure 6: Once you have cocooned the canopy and made it the width of the Tail Pocket, release the tension from the container. Sit on the canopy facing the container. Open the Velcro closures on the Tail Pocket. Using the rubber band located between the Tail Pocket and the canopy, grasp approximately 6" of line below the rubber band. Place the bite of line in the rubber band and make a double stow, as shown in Figure 6a, be certain not to over wrap the lines with the rubber band. Next, tuck the primary stow between the canopy and the Tail Pocket, as shown in figure 6b.

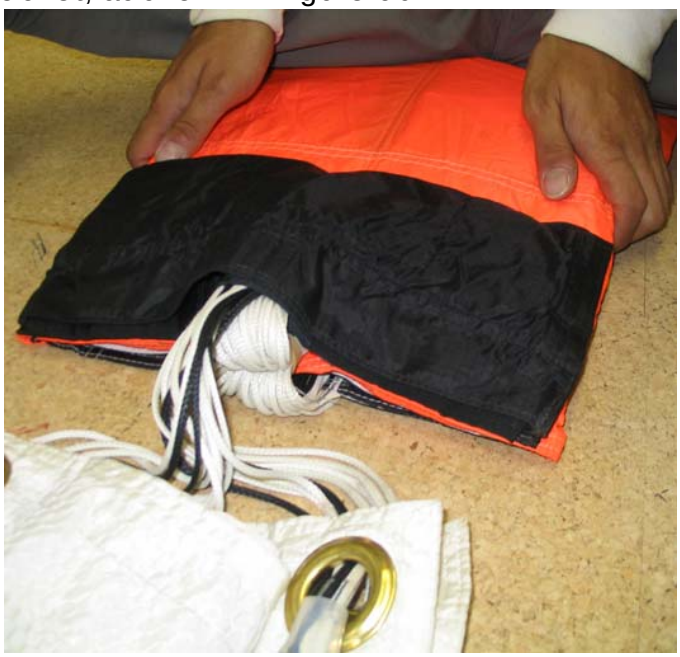


Figure 7a & 7b: S-fold lines into Tail Pocket (Slider in "down" position)

Figure 7and 7b: Bring 8" or so of line toward the Tail Pocket, creating an S-fold and lay this bite in either upper corner of the Tail Pocket. Continue S-folding the lines back and forth across the Tail Pocket. Each S-fold will slightly overlap the one before it. Stow the lines to within 5" of the top of the risers. The lines MUST enter and exit between the two Velcro tabs at the bottom center of the Tail Pocket. This helps ensure that the Velcro does not actually need to open to complete line deployment. Close the Tail Pocket by mating the Velcro to its coordinating piece. Start at the corners and work the Velcro up the sides and across the bottom making certain no lines get caught in the Velcro. Be sure to mate the Velcro exactly.

Refer to your container manual for instructions on how to pack the canopy into the container to complete the pack job.

Section 7.4: Packing for comfortable openings

When jumping the Troll DW / MDV for terminal slider up jumps you can try to follow adjustments to your pack job to help make the openings more comfortable:

1. The most significant factor that affects your openings is freefall speed. If you deploy your canopy from a track you are much more likely to experience hard openings. If possible, return to a box position before deploying to help dissipate some of your horizontal speed prior to deploying (assuming the object offers safe altitude to do so).

2. Check the suitability of your pilot chute for the delay / canopy size. An over sized pilot chute can cause line dump and center cell stripping. If you have any questions please contact us.

3. Rolling the nose is also an option on large terminal objects which allow significant object separation.

Figure 1a

Figure 1b

3. (cont)The nose can be rolled once the canopy has been placed into the container and the first fold (at the top of the container) has been made.

   Carefully pull the 3 left nose cells away from the pack job and roll the load tapes towards the center cell a few times. This process is then repeated for the 3 right nose cells, as shown in figure 1a. The center cell is left straight in the middle of the pack job in-between the two "rolls" of nose cells. The number of rolls applied to nose must be the same for each side of the canopy and can be increased up to several rolls if necessary. Once both sides of the nose have been rolled, the pack job should resemble figure 1b.

4. Direct slider control can also help slow down terminal openings. This involves attaching a bungee to the canopy C-line attachment tape and using the bungee to stow the center of the slider mesh during packing. During deployment this bungee ensures the slider only starts descending once the canopy bottom skin is inflating.

   The bungee is larks headed to the C-line load tape. You should use a rubber band 1 and $^{1}/_{4}$ inches by 1 $^{3}/_{16}$ inch (3.2 cm by 0.5cm). To make the stow take the center of the slider and make a small fold in the mesh, wrap the bungee around this bite of material twice, as shown in figures 2a and 2b.

Figure 2a

Figure 2b

Section 8: Toggle Assembly

Figure 1

Figure 1: Pass the control line through the toggle's grommet from the Velcro side of the toggle.

Figure 2

Figure 2: Then thread the bottom of the toggle through the attachment loop, pulling the slack control line back through the grommet.

Figure 3

Figure 3: The assembled toggle should look like this.

Section 9: Inspecting and Maintaining your Equipment

Your equipment will last longer, look better and function correctly if it is inspected on a regular basis and maintained accordingly. Generally, your gear should need very little maintenance unless it is subjected to unusual conditions. Let's face it though, in BASE jumping, we can be a little rough on our equipment, so it is a good idea to go over it thoroughly after every jump. This will detect the obvious but it is important to perform an intensive planned inspection from time to time. You can gauge this by how often you jump and the types of jumps that you do, the performance of the equipment, openings, landings, etc. You should perform this type of inspection at least every 10 jumps. Remember BASE jumping is a lot more demanding on our equipment than skydiving is.

There are several things that can damage a parachute system. You must avoid exposure to acids, chemicals, excessive heat, sharp objects, water, prolonged sunlight or anything that may damage the structural integrity of the system. Also remember that this is a single parachute system, so it should be inspected to the airworthiness of a reserve system, not a main.

Canopy Check List:

- Lines (4 riser groups)
- 2 Sets of Control Lines (Cat's eyes)
- Bartacks
- Line Attachment Tabs
- 1-7 Cells – Bottom
- 1-7 Cells – Inside and cross-ports
- 1-7 Cells – Top surface
- Bridle Attachment Point (top, bottom and internal)
- Stabilizers
- Slider Stitching
- Slider Fabric and Tapes
- Slider Grommets
- Tail Pocket Tabs and Velcro

Lower control lines do wear out due to slider wear. Brake settings wear out as well and wear out quicker with no slider deployments. Inspect them on a regular basis and replace them when they show signs of wear. Be sure to keep the slider grommets free from burs and sharp or rough edges. This can cause damage to the lines.

The fabric that the canopy is made of is very durable, but it must be inspected thoroughly as it is not indestructible. It is very important to inspect the entire canopy. Inspect the external portion of the canopy but be sure to crawl inside of the cells to inspect the internal portion of the canopy for structural integrity.

Any hole that is larger than $^1/_4$ of an inch or that is within 10 inches of a line attachment or the bridle attachment point should be repaired before putting it back into service. It is advised to have a qualified rigger to make repairs. Patches should be made in accordance with parachute industry standards.

Major repairs should be returned to Atair or given to a master rigger for repair. A major repair is one that gets into any seam, reinforcement tape or line attachment, or any repair that, if done incorrectly could affect the flight characteristics of the canopy.

Do not wash any canopy. In the event that the canopy is subjected to salt water rinse it thoroughly with fresh water and dry it away from direct sunlight. Do not pack or jump a wet parachute.

Appendix A: Contact details

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End